

beginning at an outward boundary of the intermediate region and  
extending to a tip end of the blade, the inner region being swept  
forward and the intermediate region being swept rearward at a  
sweep angle that does not decrease; and

the tip region is translated forward relative to a leading  
edge with the same sweep angle as the outward boundary of the  
intermediate region, to provide a sweep angle that causes the  
blade to intercept the shock.

89. The turbomachinery blade of any one of claims 4 to 7,  
wherein the inner region extends between a root end of the blade  
and the inward boundary of the intermediate region, and the  
entire inner region is swept forward.

9. A blade for a gas turbine engine fan comprising a  
plurality of blades mounted for rotation within a case  
circumscribing the blades and forming an outer boundary for a  
working medium gas flowing through passages formed by neighboring  
blades, wherein:

the blade has a configuration enabling the fan to rotate at  
speeds providing supersonic flow velocities over the blade in at  
least a portion of each passage;

the blade has a leading edge with an inner region ending at  
an inward boundary of an intermediate region and a tip region

beginning at an outward boundary of the intermediate region and  
extending to a tip end of the blade, the inner region being swept  
forward and the intermediate region being swept rearward at a  
sweep angle that does not decrease from the inward boundary of  
the intermediate region to the outward boundary of the  
intermediate region; and

throughout the tip region the sweep angle is less than the  
sweep angle at the outward boundary of the intermediate region.

10  
11. The blade of claim 10, wherein the tip region is  
translated forward relative to a leading edge with the same sweep  
angle as the outward boundary of the intermediate region.

11  
16. The blade of claim 11, wherein the inner region extends  
between a root end of the blade and the inward boundary of the  
intermediate region, and the entire inner region is swept  
forward.

15  
19. The blade of claim 10, wherein the tip region maintains  
a rearward sweep throughout the tip region.

16  
20. A gas turbine engine fan, comprising a plurality of  
blades mounted for rotation within a case circumscribing the

blades and forming an outer boundary for a working medium gas  
flowing through passages formed by neighboring blades, wherein:

each blade has a configuration enabling the fan to rotate at  
speeds providing supersonic working medium gas velocities over  
the blade at least in the vicinity of the passages proximate to  
the case;

each blade has a leading edge with an inner region ending at  
an inward boundary of a swept intermediate region and a swept tip  
region beginning at an outward boundary of the intermediate  
region and extending to a tip end of the blade, the inner region  
of each blade being swept forward and the intermediate region of  
each blade being swept rearward at a sweep angle that does not  
decrease from the inward boundary of the intermediate region to  
the outward boundary of the intermediate region; and

throughout the tip region the sweep angle of each blade is  
less than the sweep angle at the outward boundary of the  
intermediate region.

<sup>17</sup>  
21. The gas turbine engine fan of claim <sup>16</sup> 20, wherein the tip  
region is translated forward relative to a leading edge with the  
same sweep angle as the outward boundary of the intermediate  
region.

<sup>18</sup> 22. <sup>17</sup> The gas turbine engine fan of claim 21, wherein:

the intermediate region sweep angle of each blade increases throughout the intermediate region; and

the tip region sweep angle of each blade decreases throughout the tip region.

<sup>19</sup> 23. <sup>18</sup> The gas turbine engine fan of claim 22, wherein the

inner region of the leading edge of each blade begins at a root end of the blade and extends to the inward boundary of the intermediate region, and the entire inner region of each blade is swept forward.

<sup>20</sup> 27. A gas turbine engine fan comprising a plurality of

identical blades, each blade being mounted for rotation within a case circumscribing the blades and having an inner wall forming an outer boundary for a working medium gas flowing through passages formed by neighboring blades, wherein:

each blade has a configuration enabling the fan to rotate at speeds providing supersonic working medium gas velocities over the blade in the vicinity of the passages proximate to the case;

each blade has a leading edge with an inner region, an intermediate region and a tip region, the inner region extending to an inward boundary of the intermediate region, and the tip

region extending from an outward boundary of the intermediate region to a tip end of the blade; and

the inner region is swept forward, the intermediate region is swept rearward at a sweep angle that does not decrease, and the tip region is translated forward relative to a leading edge with the same sweep angle as the outward boundary of the intermediate region.

23  
42. The gas turbine engine fan of claim 27, wherein the inner wall of the case is perpendicular to pressure waves that extend spanwise of the blades as they rotate, the waves being incident to the case wall in a region of the blades.

24  
43. The gas turbine engine fan of claim 27, wherein a projection of the tip end of each blade onto a radial plane is parallel to the inner wall of the casing in longitudinal cross-section.

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30. A blade for a gas turbine engine rotatable within a case at speeds providing supersonic flow over at least a portion of the blade, wherein the blade has a leading edge with a forward swept inner region, the inner region ending at a rearward swept middle region having a sweep angle that does not decrease